BALTIMORE COUNTY, MARYLAND
DEPARTMENT OF PUBLIC WORKS & TRANSPORTATION
DIVISION OF CONSTRUCTION CONTRACTS ADMINISTRATION
111 WEST CHESAPEAKE AVENUE
TOWSON, MARYLAND 21204

Contract No. 20203 WX0
Towson Water Pumping Station Renovations –
7781 Far Hills Drive, Towson, Maryland 21286
Towson – District 9c5
Job Order No. / Workday No.
231-203-0035-0445 / 030350445

ADDENDUM NO.6

DATE: 10/27/2023

Contact: Anthony Crews, 410-887-3531, tcrews@baltimorecountymd.gov

To All Bidders

This addendum is hereby made a part of the Proposal and the Special Provisions, and is hereby incorporated into the Contract. Should this addendum conflict with any portion of the Special Provisions, the Proposal, or any prior addenda, this addendum shall supersede and control.

Please note the attached changes, corrections, and/or information in connection with the contract and submit bids and be otherwise governed accordingly.

For Your Information

Attached is the Geotechnical Report and Soil Boring Logs.

Attachments – 36

PLEASE SIGN BELOW ACKNOWLEDGING RECEIPT OF THIS ADDENDUM AND RETURN WITH YOUR BID.

_____ _____
Company Name **Signature**

Geotechnical Report

TOWSON FINISHED WATER RESERVOIR GENERATOR & SUBSTATION BUILDINGS

BALTIMORE, MARYLAND

Prepared for:

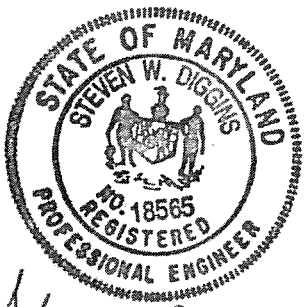
Gannett Fleming, Inc.
7133 Rutherford Road, Suite 300
Baltimore, Maryland 21244

Prepared by:

EBA Engineering, Inc.
4813 Seton Drive | Baltimore, MD 21215
(410) 358-7171 | www.ebaengineering.com

Project No. 3090-03

August 2013



Professional Certification. I hereby certify that these documents were prepared or approved by me, and that I am a duly licensed professional engineer under the laws of the State of Maryland.
License No.: 18565, Expiration Date: 01/19/2014.

Contract No.20203 WX0
Addendum No.6
October 27, 2023

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INTRODUCTION

EBA Engineering, Inc. (EBA) was retained by Gannett Fleming, Inc. (Gannett Fleming) to perform a geotechnical investigation for the proposed improvements at the Towson Finished Water Reservoir in Baltimore, Maryland. Gannett Fleming is performing the design of the project through a contract with Baltimore City. The proposed improvements include the construction of emergency generator and substation buildings.

The purpose of the investigation was to determine the stratigraphy and engineering characteristics of the soils at the project site, and to provide recommendations for the design and construction of the proposed buildings in consideration of the subsurface conditions. This report presents a description of the investigation, summary of the subsurface conditions, and recommendations regarding the design and construction of foundations for the proposed emergency generator and substation buildings. The report appendices include a project vicinity map, soil boring location plan, boring logs and laboratory test results.

SITE GEOLOGY

The project site lies on the western edge of the transition zone between the Atlantic Coastal Plain and the Piedmont Plateau physiographic provinces, a boundary commonly referred to as the Fall Line or Fall Zone. The stratigraphy of the Fall Line zone is characterized by a relatively thin capping of Coastal Plain sediment and/or residual soils on the crystalline rocks of the Piedmont. The Maryland Geological Survey's map of the Towson Quadrangle (1974) indicates the presence of sediment at the project site consisting of the sand and gravel facies of the Patuxent Formation, a division of the Potomac Group of Cretaceous age. The sand and gravel facies consist of well sorted medium to fine grained quartz sand with locally abundant quartz gravel and clay clasts/layers. These facies are characterized by abrupt horizontal and vertical changes in lithology between the sand and gravel facies and the clay facies.

Generally, the bedrock in the Piedmont Plateau physiographic province has been weathered at the surface forming a relatively thin residuum of soil-like material. This residuum, including residual soil and decomposed rock, is the result of in-situ weathering of the parent bedrock. Residual soil is completely weathered and may not possess relict features of the parent rock. Decomposed rock is highly weathered, generally more coarse and rocky than residual soil and retains relict features of the parent rock such as coloring, discontinuities and bedding planes. Large cobble to boulder-sized fragments of rock are common in Piedmont soils. Piedmont soils generally become harder and denser with increasing depth.

PREVIOUS SUBSURFACE INVESTIGATION

A previous subsurface investigation was conducted in June, 2006. The investigation included three soil borings, numbered BT-1, BT-2 and BT-12, which were performed in the vicinity of proposed generator building. These borings were advanced to depths ranging from 43.8 to 45.0 feet. Information from the previous subsurface investigation was reviewed and considered along with the data from the current investigation. The boring locations are shown on the Soil Boring Location Plan presented in Appendix B and boring logs are included in Appendix E.

SUBSURFACE EXPLORATION

The subsurface exploration program consisted of two soil borings, numbered BT-13 and BT-14. The boring locations were staked in the field by EBA based on measurements to existing features shown on a plan provided by Gannett Fleming. The locations of underground utilities in the vicinity of each boring location were marked prior to performing the borings. The as-drilled location of each boring is shown on the Soil Boring Location Plan presented in Appendix B.

The borings were performed by MDA Drilling, Inc. (MDA) in August, 2013 under the direction of a geotechnical engineer from EBA. Borings BT-13 and BT-14 were advanced to a depth of 20 feet by the hollow stem auger drilling method using an ATV-mounted drilling rig. Standard Penetration Tests (SPT) were generally performed in the borings at 2.5-foot intervals to a depth of 10 feet and at 5-foot intervals thereafter. A soil sample was collected with a split barrel sampler at each SPT location.

The water level depth in each boring was measured upon completion and after 24 hours. Each boring was backfilled immediately after the final water level depth was recorded.

Descriptions of the soils encountered, SPT results, groundwater observations and other information are provided on the boring logs, which are presented in Appendix C. The ground surface elevations shown on the logs are based on the topographic information shown on a plan provided by Gannett Fleming. The soil descriptions provided on the logs were determined in general accordance with the procedures described in ASTM D2488 (ASTM International's version of the Unified Soil Classification System [USCS]).

LABORATORY TESTING

The soil samples obtained from the borings were transported to EBA's laboratory, where selected representative samples were tested to determine the moisture contents, particle size distributions, and liquid and plastic limits of the soils. The results of the laboratory tests were used to determine certain engineering properties and to aid in the classification of the soils. Graphic plots and a tabular summary of the laboratory test results are provided in Appendix D.

SUBSURFACE CONDITIONS

Topsoil

Topsoil was encountered at the surface at the location of Boring BT-13. The thickness of the Topsoil was 5 inches as noted in the "Remarks" column of the boring log.

Existing Fill

Existing fill was encountered at the surface at the location of Boring BT-14, and underlying the Topsoil in Boring BT-13. The depth to the bottom of this layer ranged from 6 to 8.5 feet. The Existing Fill consisted of medium stiff to very stiff, sandy CLAY and sandy SILT, and medium dense to very dense, silty SAND and GRAVEL with varying amounts of sand. Traces of roots and plastic pieces were observed in the samples. The SPT N-values in this layer ranged from 5 to more than 100 blows per foot and the average was 39 blows per foot.

The moisture content of one selected sample from this layer was 20.0 percent. The USCS symbols for the soils in this layer were found to include GM, SM, ML and CL and the AASHTO soil classification symbols were found to include A-1-b, A-2-4, A-4 and A-6 based on visual classifications.

Sandy Clay

Sandy Clay was encountered underlying the Existing Fill in Boring BT-14. The depth to the bottom of this layer was 12 feet. This layer is believed to be associated with the Clay facies of Patuxent Formation. The Sandy Clay consisted of stiff to very stiff, sandy lean CLAY. The SPT N-values in this layer ranged from 14 to 30 blows per foot and the average was 22 blows per foot.

The moisture content of one selected sample from this layer was 22.6 percent. The liquid limit of the selected sample was 48 and the plasticity index was 22. The USCS symbol for the soil in this layer was found to be CL and the AASHTO soil classification symbol was found to be A-7-6 based on laboratory test results and visual classifications.

Residual Soil

Residual soils were encountered underlying the Existing Fill in Boring BT-13 and underlying the Sandy Clay in Boring BT-14. The depth to the bottom of this layer was more than 20 feet (i.e., exceeded the boring depth). The Residual Soil consisted of medium dense to very dense, silty SAND. The SPT N-values in this layer ranged from 17 to 53 blows per foot and the average was 36 blows per foot.

The moisture contents of selected soil samples collected from this layer ranged from 12.5 to 25.9 percent. The liquid limit of two selected samples from this layer was 48 and

the plasticity indexes were 15 and 17. The USCS symbol for the soil in this layer was found to be SM, and the AASHTO soil classification symbols were found to include A-2-4, A-2-7 and A-7-5 based on the laboratory test results and visual classifications.

Water Level Observations in the Boreholes

Water level observations were generally made in each boring upon completion and after 24 hours. The measured water level depths are noted on the boring logs and are presented in Table 1.

Table 1: Summary of Water Level Observations in the Boreholes

Boring No.	Ground Surface Elev.	Measurements at Completion		Measurements after 24 hours	
		Water Level Depth (feet)	Water Level Elev.	Water Level Depth (feet)	Water Level Elev.
BT-13	482	Dry @ 19.0'	Dry @ 463.0'	Dry @ 19.0'	Dry @ 463.0'
BT-14	494	Dry @ 20.0'	Dry @ 474.0'	Dry @ 20.0'	Dry @ 474.0'

The water level depth observations are an indication of the groundwater level at the time of the investigation. Be advised that fluctuations in groundwater levels may occur due to variations in season, rainfall, construction activity, and other site-specific factors.

CONCLUSIONS AND RECOMMENDATIONS

According to the drawings provided by Gannett Fleming, the proposed improvements include the construction of generator and substation buildings. A new concrete retaining wall will be constructed around the east and south sides of the generator building.

Generator Building

The proposed generator building will be constructed adjacent to the existing underground sand filter. The proposed generator building will house a new standby diesel generator and switchgear equipment, and includes an adjacent retaining wall. The proposed building will include a slab-on-grade and the walls will be supported on spread footings. The building will be approximately 45 feet long and 24 feet wide and the proposed finished floor elevation will be 503 (feet). It is anticipated that the bottom of the footings will be placed at least 2.5 feet below the final exterior grade, which will correspond to an elevation of about 500 (feet). Boring BT-14 was performed in the vicinity of the proposed generator building as well as previous Borings BT-1, BT-2 and BT-12.

Based on the drawings provided by Gannett Fleming, the proposed generator building will be located at the site of a former reservoir embankment. The embankment was excavated during the construction of the new finished water reservoir and subsequently, onsite soils were stockpiled. An existing 18-inch storm drain that crosses the proposed building site will be relocated.

Our analysis included an evaluation of the soil support for the proposed spread footings. Based on the subsurface conditions found in the borings performed in the vicinity of the proposed generator building, it appears that the footings will bear on the Existing Fill. The Existing Fill is not suitable for support of the footings due to its variable consistency and potential for excessive settlement. Therefore, it is recommended that the Existing Fill below the proposed footings be removed and replaced with compacted structural fill. Appendix F contains a *Footing Subgrade Modification Detail*, depicting the soil removal/replacement technique. As indicated in the detail, the removal of the Existing Fill should extend to a depth below each footing equal to at least two times the footing width, and should extend laterally from all sides of each footing a distance equal to the footing width.

The bottom of the Existing Fill encountered in Borings BT-1, BT-2, BT-12 and BT-14 ranged from elevation 487 to 494 (feet).

The building and retaining walls may be supported by spread footings founded on subgrades that have been modified as described above. The net allowable bearing capacity will be 2,000 psf after the subgrade has been modified. The total settlement of the footing is estimated to be 1.0 inch or less and differential settlement is not expected to exceed 0.5 inch.

It is recommended that the removal of the Existing Fill and replacement with structural fill be observed by a geotechnical engineer and/or their designated representative during construction. Test pit excavations and penetrometer testing will be needed to assess the extent of the Existing Fill within the area of the building at the time of construction. Thus, it would be prudent to include contingencies in the construction estimate/budget to account for these conditions.

Groundwater was not encountered in Boring BT-14. However, groundwater was encountered in previously drilled Borings BT-1, BT-2 and BT-12 during drilling at depths ranging from 18.8 to 40.5 feet. These depths correspond to elevations that range from 472 to 479.5 (feet). It is anticipated that the bottom of footing will be at about elevation 500 (feet) and the excavation of Existing Fill will extend to about elevation 492 (feet). Therefore, it expected that groundwater will not be encountered in the excavations.

Substation Building

The proposed substation building will be constructed between pumping stations no.2 and no.3. The proposed substation building will house new switchgear equipment and two transformers. The proposed building will include a slab-on-grade and the walls will

be supported on spread footings. The building will be approximately 59 feet long and 27.5 feet wide. The proposed finished floor elevation will be 486 (feet). It is anticipated that the bottom of the footings will be placed at least 2.5 feet below the final exterior grade, which will correspond to about elevation 483 (feet). Boring BT-13 was performed at the location of the proposed substation building.

Based on the drawings provided by Gannett Fleming, there are existing underground utilities at the location of proposed substation building that include a ductbank, 2-inch waterline, fire hydrant and 12-inch storm drain. These utilities will be relocated prior to construction of the building.

Our analysis included an evaluation of the soil support for the proposed spread footings. Based on the subsurface conditions found in Boring BT-13, it appears that the footings will bear on the Existing Fill. The Existing Fill is not suitable for support of the footings due to its variable consistency and potential for excessive settlement. Therefore, it is recommended that the Existing Fill below the proposed footings be removed and replaced with compacted structural fill. Appendix F contains a *Footing Subgrade Modification Detail*, depicting the soil removal/replacement technique. As indicated in the detail, the removal of the Existing Fill should extend to a depth below each footing equal to at least two times the footing width, and should extend laterally from all sides of each footing a distance equal to the footing width.

The bottom elevation of the Existing Fill in Boring BT-13 was 473.5 (feet).

The building foundations may be supported by spread footings founded on subgrades that have been modified as described above. The net allowable bearing capacity will be 2,000 psf after the subgrade has been modified. The total settlement of the footing is estimated to be 1.0 inch or less and differential settlement is not expected to exceed 0.5 inch.

It is recommended that the removal of the Existing Fill and replacement with structural fill be observed by a geotechnical engineer and/or their designated representative during construction. Test pit excavations and penetrometer testing will be needed to assess the extent of the Existing Fill within the area of the building at the time of construction. Thus, it would be prudent to include contingencies in the construction estimate/budget to account for these conditions.

Groundwater was not encountered in Boring BT-13, which extended to an elevation of approximately 462 (feet). The bottom of footing will be at an elevation 483 (feet) and the excavation of Existing Fill will extend to an elevation of about 475 (feet). Therefore, it is expected that groundwater will not be encountered in the excavations.

Slabs-on-Grade

The slabs-on-grade for the generator and substation buildings are also expected to bear on the Existing Fill. Slabs-on-grade should not be founded on soft/loose soils. Thus, the

subgrades should be thoroughly proofrolled with a fully loaded tandem axle dump truck or equivalent prior to constructing the slabs. The purpose of the proofrolling is to locate any soft, loose or otherwise unsuitable pockets of soils. Unsuitable subgrade soils should be removed and replaced with structural fill. It is recommended that the prepared slab subgrades be evaluated by a geotechnical engineer or designated representative immediately prior to stone and concrete placement. This evaluation may include a combination of visual observations, proofrolling, hand-rod probing, and field density tests to verify that the subgrade soils have been prepared properly.

The concrete slabs-on-grade should be reinforced with steel reinforcing bars or welded wire fabric. A layer of at least 4 inches of ASTM C33, Size No. 57 stone should be provided beneath the slabs as a drainage layer. A polyethylene vapor barrier should be placed over the stone prior to concrete placement. At least 12 inches of compacted structural fill should be placed below the drainage layer for the slabs-on-grade. The recommended modulus of subgrade reaction (k_s) for the design of the proposed slabs is 90 pounds per cubic inch (pci).

Retaining Wall

The retaining wall at the generator building should be designed to support the lateral earth pressures imposed by backfill placed against the wall, hydrostatic pressures and appropriate surcharge loads. Based on the assumption that the fill and backfill recommendations contained in this report are followed during construction, the lateral earth pressures may be calculated using the parameters presented below.

Moist Soil Unit Weight = 125 pcf
Effective Soil Friction Angle (φ) = 30 degrees
Cohesion = 0 psf

At-rest earth pressure values should be used for conditions that do not allow movement of a wall away from the soil mass. The at-rest earth pressure coefficient, K_o, should be calculated as $K_o = 1 - Sin\varphi$.

Active earth pressure values should be used when conditions allow movement of the walls away from the soil mass. The active earth pressure coefficient, K_a, should be calculated as $K_a = \tan^2(45 - \varphi/2)$.

Passive earth pressures occur when a buried structural element imposes a horizontal load on the soil mass. Typically, the coefficient of passive earth pressure, K_p, is calculated as $K_p = \tan^2(45 + \varphi/2)$.

The equivalent fluid pressures on the walls, p, may be calculated by the following equation, $p = K\sigma_v$; where, K is the earth pressure coefficient and σ_v is the vertical overburden stress at depth, z (z is the depth below grade behind the wall or the depth

below the toe line in front of the wall). When the soil is in the active state, $K = K_a$; when the soil is in the at-rest state, $K = K_o$; and when the soil is in the passive state, $K = K_p$.

The horizontal friction coefficient between the natural soils or compacted fill and concrete foundations is estimated to be 0.35. The friction coefficient between compacted backfill and the concrete foundation walls is estimated to be 0.35.

A drainage system should be installed just above the footing against the back of the retaining wall. The drainage system should consist of 4-inch diameter perforated pipe encased in 4 inches of ASTM C33 Size No. 7 coarse aggregate and wrapped with a permeable geotextile fabric, such as MIRAFI 140N. The drainage system will serve to prevent the build-up of hydrostatic pressure behind the wall. The drainage system should be designed to drain by gravity to a storm water system or to the final grade.

Groundwater Control

Boring BT-14 and previous Borings BT-1, BT-2 and BT-12 were performed in the vicinity of the proposed generator building. Groundwater was not encountered in Boring BT-14. However, groundwater was encountered in previously drilled Borings BT-1, BT-2 and BT-12 at elevations that ranged from 472 to 479.5 (feet). It is anticipated that the excavation of Existing Fill at the proposed generator building site will extend to about elevation 492 (feet). Therefore, it is expected that groundwater will not be encountered in the excavations.

Boring BT-13 was performed at the location of the proposed substation building. Groundwater was not encountered in Boring BT-13 which extended to an elevation of approximately 462 (feet). The bottom of footing will be at an elevation of 483 (feet) and the excavation of Existing Fill will extend to an elevation of about 475 (feet). Therefore, it is expected that groundwater will not be encountered in the excavations at the proposed substation building.

Dewatering will likely be limited to removing stormwater runoff that flows into the excavations. Commonly used dewatering techniques include pumping from sumps within the excavations.

Fill and Backfill

All fill and backfill should be free of organic matter, muck, trash, debris, frozen material and particles larger than 3 inches.

Structural fill and backfill: Structural fill and backfill should be placed within the building areas, paved areas and within 5 feet of all structures. Structural fill and backfill should consist of materials classified as A-1-a, A-1-b, A-2-4, and A-3, in accordance with AASHTO M 145. The materials should have a liquid limit and plasticity index less than 40 and 10, respectively. In addition, the maximum dry density, determined in accordance with AASHTO T-180, should be no less than 110 pcf.

Structural fill and backfill should be placed in horizontal layers not more than 8 inches thick. Each layer should be compacted to no less than 97% of the maximum dry density of the soil determined in accordance with AASHTO T-180.

Common fill and backfill: Common fill and backfill may be used in unpaved areas more than 5 feet away from structures. Common fill and backfill should consist of soils classified as A-1-a, A-1-b, A-2-4, A-2-5, A-2-6, A-2-7, A-3, A-4, A-5 and A-6 in accordance with AASHTO M 145. In addition, the maximum dry density, determined in accordance with AASHTO T-180, should be no less than 100 pcf.

Common fill and backfill should be placed in horizontal layers not more than 8 inches thick. Common fill and backfill should be compacted to no less 92% of the maximum dry density determined in accordance with AASHTO T-180.

The soils encountered in the borings classified as A-1-b and A-2-4 are expected to be suitable for use as structural fill and backfill. The soils encountered in the borings classified as A-1-b, A-2-4, A-2-7, A-4 and A-6 are expected to be suitable for use as common fill and backfill.

Each lift of fill and backfill should be within 2 percent of the optimum moisture content prior to compaction. Each layer of fill and backfill should be compacted to the specified density before the placement of subsequent lifts.

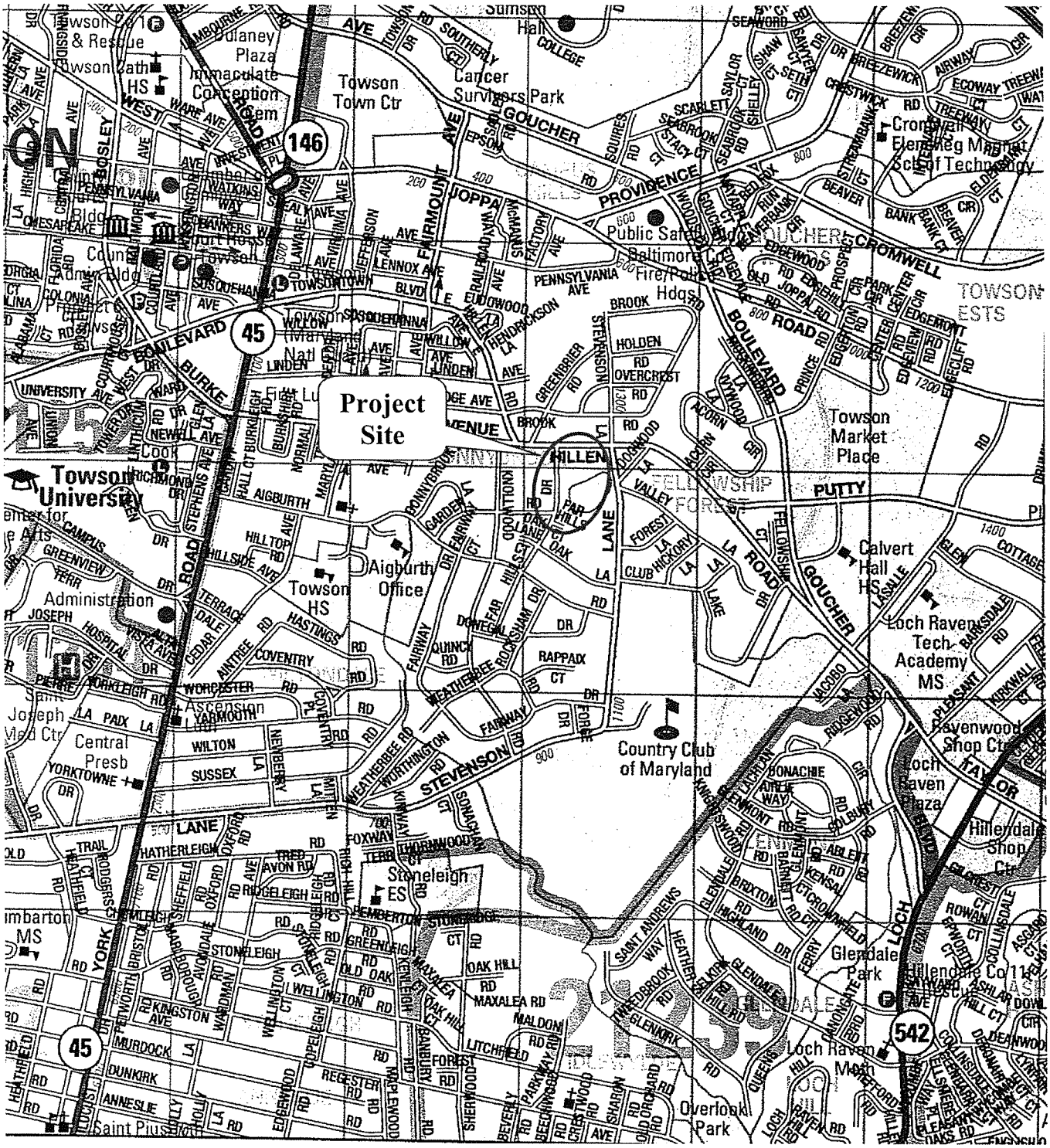
Inspection and Testing

All earthwork and foundation construction should be inspected by a testing agency experienced in similar work. The testing agency should inspect the foundation and slab-on-grade subgrades, perform field density (i.e., compaction) tests on each layer of backfill, perform bearing capacity verification tests (i.e., penetrometer tests) and conduct laboratory tests as necessary to approve backfill materials. All inspection and testing should be performed under the supervision of a registered professional engineer experienced in geotechnical engineering.

LIMITATIONS

The conclusions and recommendations presented in this report are based on the data collected during the geotechnical investigation. Variations in the subsurface conditions may be discovered during construction. EBA will be available to assist in determining a solution to any geotechnical problem that may arise during the construction of this project.

Appendix A
Project Vicinity Map



EBA *EBA ENGINEERING, INC.* *4813 Seton Drive* *Baltimore, Maryland 21215*	Project Name: **TOWSON FINISHED WATER RESERVOIR - GENERATOR & SUBSTATION BUILDINGS** **BALTIMORE, MD**	**Project Vicinity Map** Date: 8/6/13 Job No.: 3090-03-002 Prepared by: GCB

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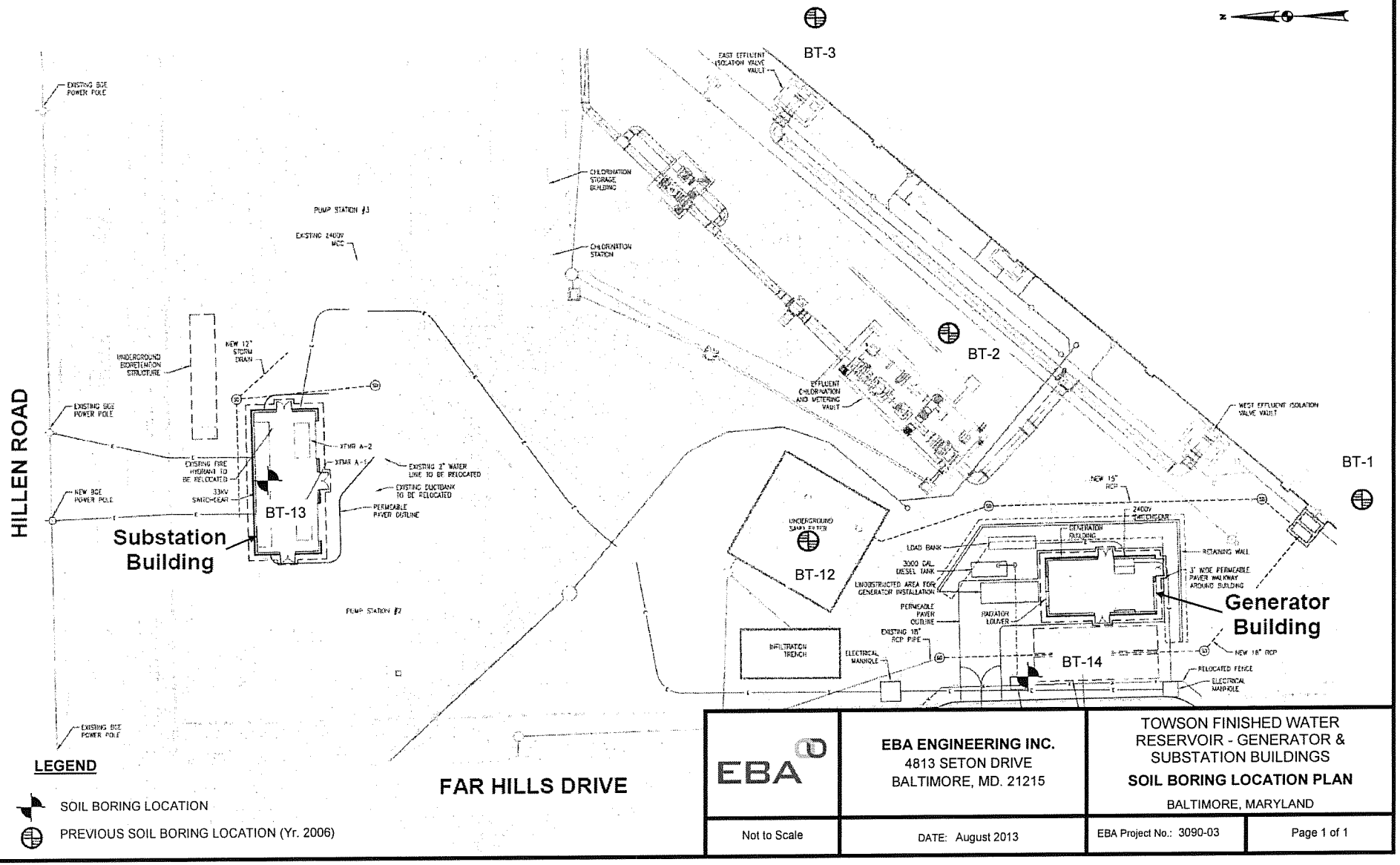
Appendix B

Soil Boring Location Plan



EBA

EBA ENGINEERING INC.
4813 SETON DRIVE
BALTIMORE, MD. 21215

TOWSON FINISHED WATER RESERVOIR - GENERATOR & SUBSTATION BUILDINGS

SOIL BORING LOCATION PLAN

BALTIMORE, MARYLAND

Not to Scale	DATE: August 2013	EBA Project No.: 3090-03	Page 1 of 1

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Appendix C
Boring Logs

RECORD OF SUBSURFACE EXPLORATION

Project: Towson Finished Water Reservoir - Generator & Substation Bldgs
Location: Baltimore, MD
Job Number: 3090-03
Inspector: Girish Bhatt
Boring Method: HSA
Hole Diameter: 8"
Water Level at Completion: Dry @ 19.0'
Water Level After 24 hrs: Dry @ 19.0'

Boring Number: BT-13
Drilling Company: MDA Drilling Inc.
Driller: Duane Addison
Date Drilled: 08-01-13 & 08-01-13
Surface Elevation: 482' (est)
Hammer Weight/Drop: 140 lb/30 in
Northing: N/A
Easting: N/A

Elevation (ft)	Water/Caved Depth (ft)	Description	Depth (ft)	Sampler	Number	Blows/6"	Recovery (inches)	Remarks
482			0					5 inches of topsoil.
481–480		Brown, moist, very stiff, sandy SILT, trace gravel and roots (Fill).		■	S-1	5 - 7 - 11	16	
479–478		Reddish brown / gray, moist, medium stiff, sandy CLAY (Fill).	5	■	S-2	3 - 2 - 3	10	
477–475		Reddish brown / light brown, moist, medium dense, silty SAND (Fill).		■	S-3	2 - 7 - 5	7	
474–473		Reddish brown / gray, moist, medium dense, silty SAND (Residual Soil).	10	■	S-4	3 - 7 - 10	18	
472–468		Gray / white / pink, moist, dense, silty SAND (Residual Soil).	15	■	S-5	7 - 13 - 23	18	
467–463		Dark brown / light brown, moist, dense, silty SAND (Residual Soil).		■	S-6	5 - 14 - 28	18	Installed temporary pipe @ 19.0 feet.
462		Bottom of Boring @ 20.0 ft	20					
461–453			25					

RECORD OF SUBSURFACE EXPLORATION 3090-03 TOWSON FINISHED WATER RESERVOIR - ADDITIONAL WORK.GPJ EBA ENGINEERING INC.GDT 8/23/13

EBA Engineering, Inc.
4813 Seton Drive
Baltimore, Maryland 21215

■ = Split Spoon

▽ Water Level At Completion
▼ Water Level After 24 hrs
Caved Depth At Completion
Caved Depth After 24 hrs

RECORD OF SUBSURFACE EXPLORATION

Project: Towson Finished Water Reservoir - Generator & Substation Bldgs
Location: Baltimore, MD
Job Number: 3090-03
Inspector: Girish Bhatt
Boring Method: HSA
Hole Diameter: 8"
Water Level at Completion: Dry @ 20.0'
Water Level After 24 hrs: Dry @ 20.0'

Boring Number: BT-14
Drilling Company: MDA Drilling Inc.
Driller: Duane Addison
Date Drilled: 08-01-13 & 08-01-13
Surface Elevation: 494' (est)
Hammer Weight/Drop: 140 lb/30 in
Northing: N/A
Easting: N/A

Elevation (ft)	Water/Caved Depth (ft)	Description	Depth (ft)	Sampler	Number	Blows/6"	Recovery (inches)	Remarks
494			0					No topsoil, construction site.
493		Gray, dry, very dense, GRAVEL, trace sand (Fill).			S-1	27 - 37 - 23	12	
492								
491					S-2	50/1"	1	
490		Gray / dark brown, dry, very dense, GRAVEL, with sand, trace roots and plastic pieces (Fill).						
489			5					
488		Light brown / white, moist, very stiff, sandy CLAY.			S-3	20 - 15 - 15	15	
487								
486								
485		Light brown / white, moist, stiff, sandy CLAY.			S-4	7 - 7 - 7	2	
484			10					
483								
482								
481								
480		Reddish brown / gray, moist, very dense, silty SAND (Residual Soil).			S-5	23 - 23 - 30	3	Two attempts.
479			15					
478								
477								
476								
475		Reddish brown / gray, moist, medium dense, silty SAND (Residual Soil).			S-6	30 - 14 - 16	12	
474			20					Installed temporary pipe @ 20.0 feet.
473		Bottom of Boring @ 20.0 ft						
472								
471								
470								
469			25					
468								
467								
466								
465								

RECORD OF SUBSURFACE EXPLORATION 3090-03 TOWSON FINISHED WATER RESERVOIR - ADDITIONAL WORK.GPJ EBA ENGINEERING INC.GDT 8/23/13

EBA

EBA Engineering, Inc.
4813 Seton Drive
Baltimore, Maryland 21215

■ = Split Spoon

▽ Water Level At Completion
▼ Water Level After 24 hrs
⊥ Caved Depth At Completion
▨ Caved Depth After 24 hrs

Appendix D
Laboratory Test Results

TOWSON FINISHED WATER RESERVOIR – GENERATOR SUBSTATION BUILDINGS
Baltimore, Maryland
SUMMARY OF LABORATORY TEST RESULTS

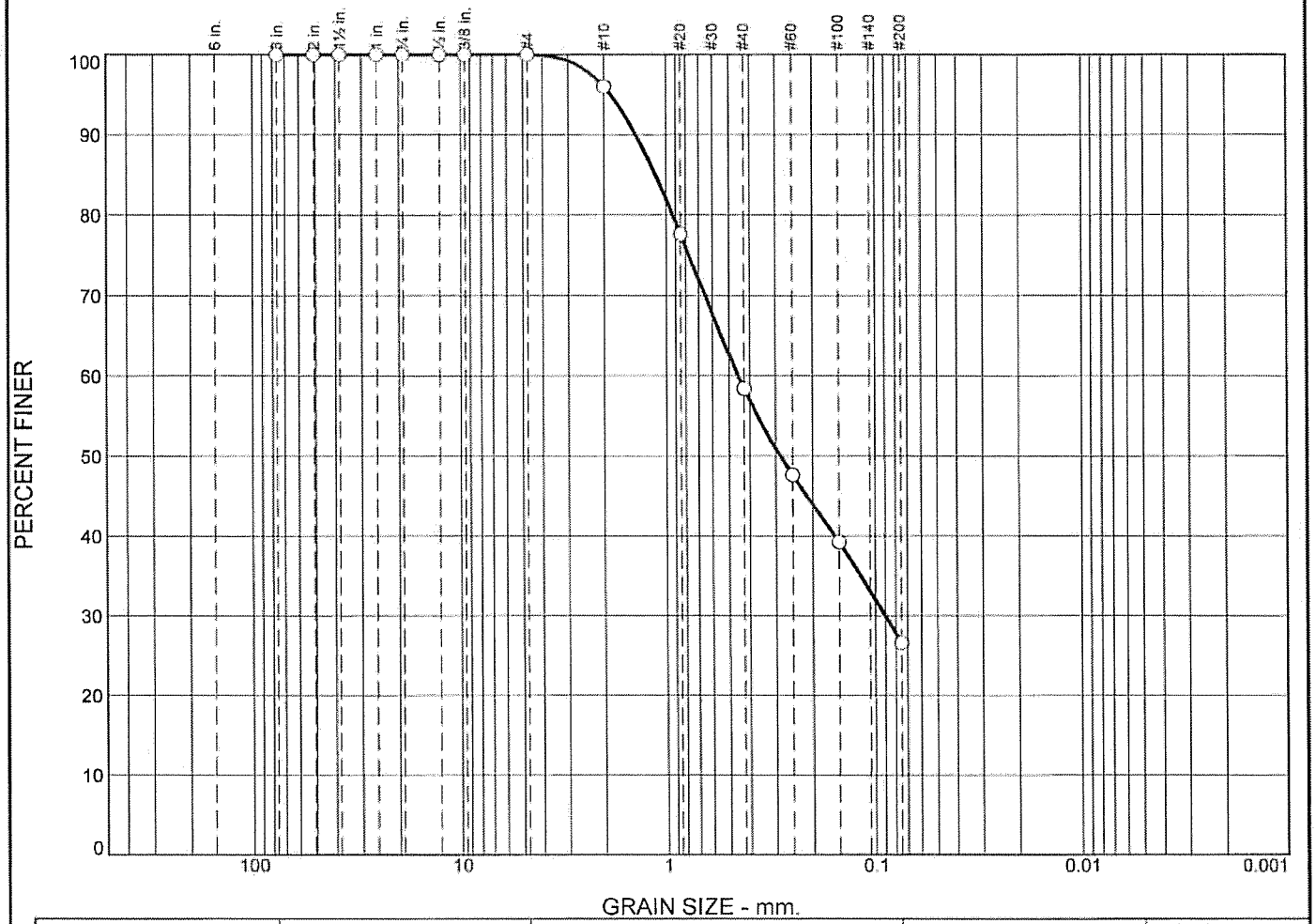
Boring No.	Sample No.	Depth (ft)	Moisture Content %	Atterberg Limits (%)		Grain Size Analysis			Soil Classification	
				LL	PI	Gravel %	Sand %	Fines %	USCS	AASHTO
BT-13	S-2	3.5-5.0	20.0							
	S-4	8.5-10.0	12.5	---	---	0.0	73.4	26.6	SM	A-2-4
	S-5	13.5-15.0	19.8	---	---	0.3	67.3	32.4	SM	A-2-4
	S-6	18.5-20.0	25.9	48	17	0.4	70.8	28.8	SM	A-2-7
BT-14	S-3	6.0-7.5	22.6	48	22	0.5	30.1	69.4	CL	A-7-6
	S-6	18.5-20.0	24.6	48	15	0.3	54.9	44.8	SM	A-7-5

LL: Liquid Limit	USCS: Unified Soil Classification System
PI: Plastiicty Index	AASHTO: American Assoc. of State Highway and Transportation Officials

EBA

EBA Engineering Inc.

Particle Size Distribution Report



	% +3"	% Gravel	% Sand	% Silt	% Clay
○	0.0	0.0	73.4	26.6	

	LL	PL	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
○			1.1249	0.4533	0.2854	0.0899				

Material Description	USCS	AASHTO
○ Reddish brown / gray silty sand	SM	A-2-4

Project No. 3090-03-002 **Client:** Gannett Fleming, Inc.

Project: Towson FWR-Generator & Substation Bldgs, Baltimore, MD

○ **Source of Sample:** BT-13 **Depth:** 8.5'-10.0' **Sample Number:** S-4

EBA Engineering, Inc.

Baltimore, MD

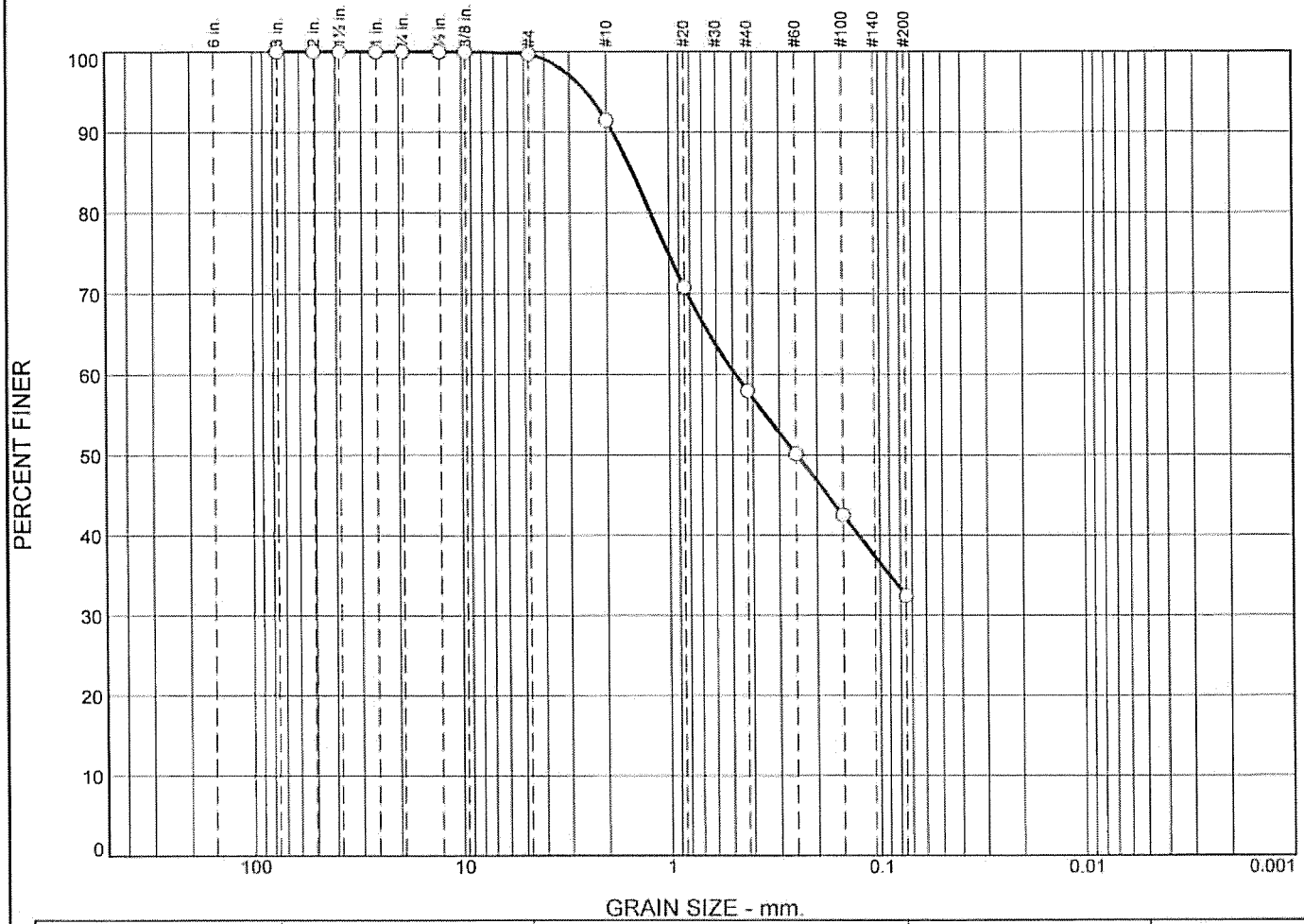
Remarks:

○ Visual classification in accordance with ASTM D2488
Moisture content = 12.5%
Date tested: 08/2013

Figure

Tested By: SB **Checked By:** SK

Particle Size Distribution Report



	% +3"	% Gravel	% Sand	% Silt	% Clay
○	0.0	0.3	67.3	32.4	

	LL	PL	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
○			1.4905	0.4843	0.2477					

Material Description	USCS	AASHTO
○ Gray / white / pink silty sand	SM	A-2-4

Project No. 3090-03-002 **Client:** Gannett Fleming, Inc.

Project: Towson FWR-Generator & Substation Bldgs, Baltimore, MD

○ **Source of Sample:** BT-13 **Depth:** 13.5'-15.0' **Sample Number:** S-5

EBA Engineering, Inc.

Baltimore, MD

Remarks:

○ Visual classification in accordance with ASTM D2488

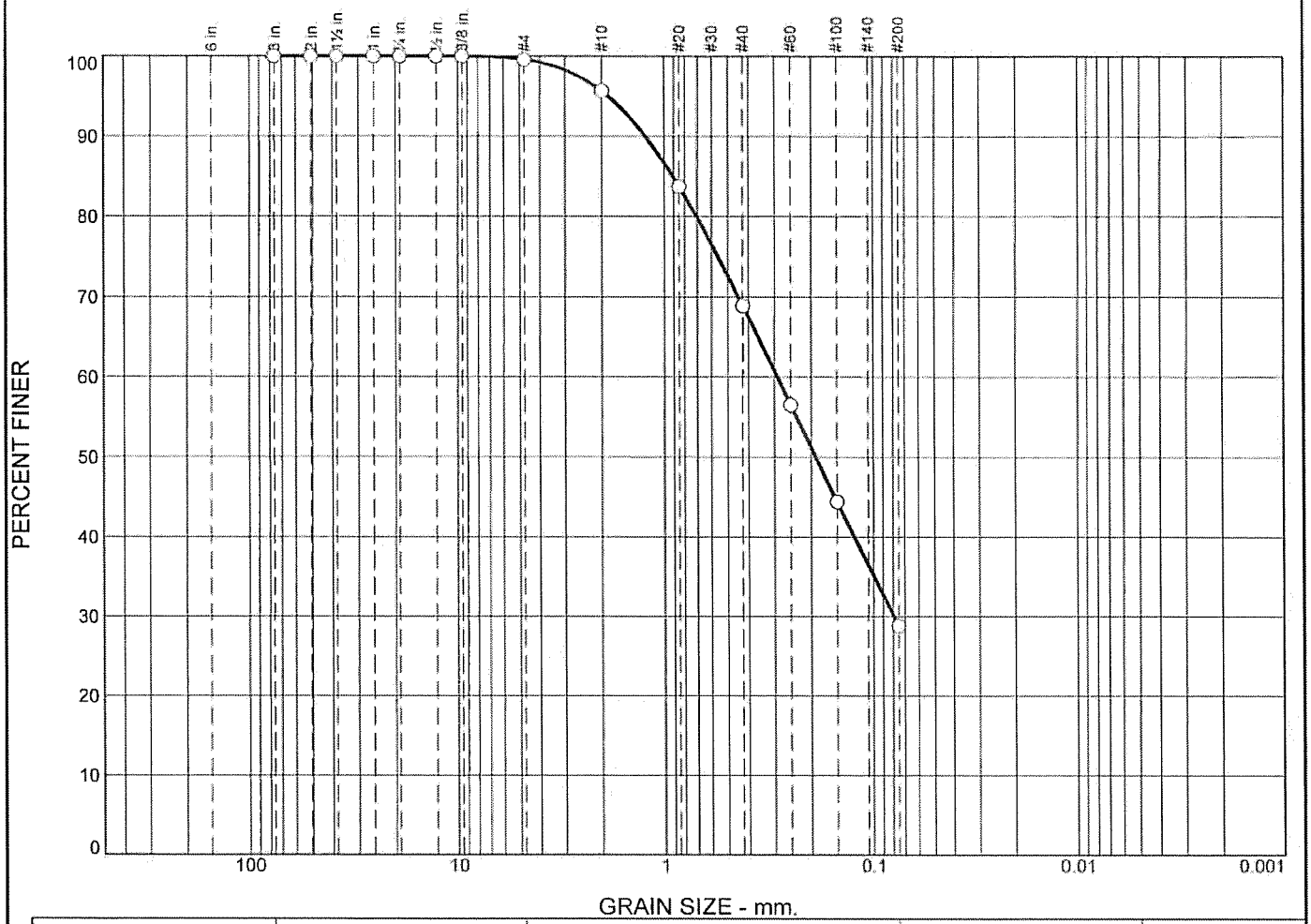
Moisture content = 19.8%

Date tested: 08/2013

Figure

Tested By: SB **Checked By:** SK

Particle Size Distribution Report



	% +3"	% Gravel	% Sand	% Silt	% Clay
○	0.0	0.4	70.8	28.8	

	LL	PL	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
○	48	31	0.9087	0.2899	0.1902	0.0792				

Material Description	USCS	AASHTO
○ Dark brown / light brown silty sand	SM	A-2-7(1)

Project No. 3090-03-002 **Client:** Gannett Fleming, Inc.

Project: Towson FWR-Generator & Substation Bldgs, Baltimore, MD

○ **Source of Sample:** BT-13 **Depth:** 18.5'-20.0' **Sample Number:** S-6

Remarks:

○ Moisture content = 25.9%

Date tested: 08/2013

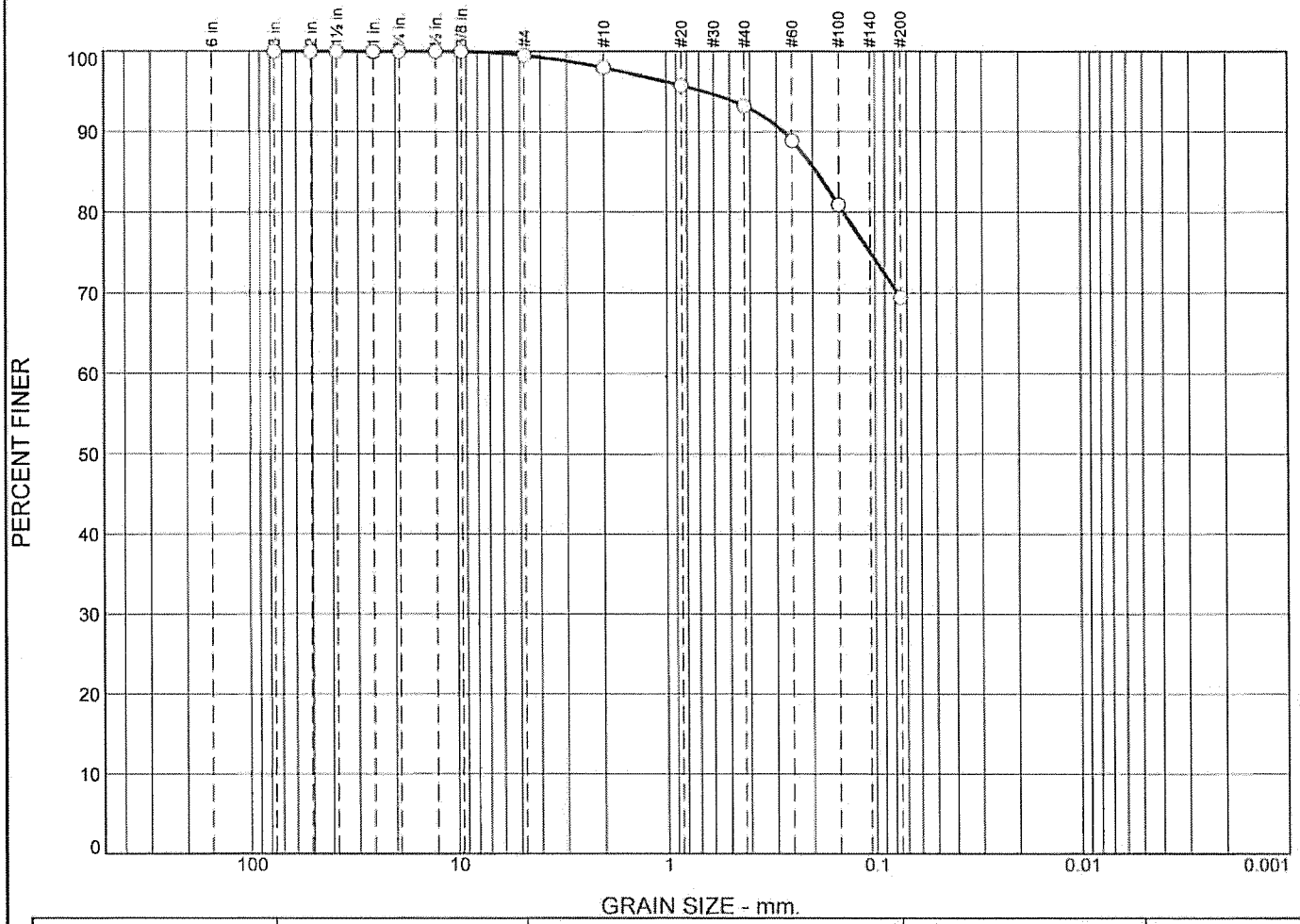
EBA Engineering, Inc.

Baltimore, MD

Figure

Tested By: SB **Checked By:** SK

Particle Size Distribution Report



	% +3"	% Gravel	% Sand	% Silt	% Clay
○	0.0	0.5	30.1	69.4	

	LL	PL	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_C	C_u
○	48	26	0.1907							

Material Description	USCS	AASHTO
○ Light brown / white sandy lean clay	CL	A-7-6(15)

Project No. 3090-03-002 **Client:** Gannett Fleming, Inc.

Project: Towson FWR-Generator & Substation Bldgs, Baltimore, MD

○ **Source of Sample:** BT-14 **Depth:** 6.0'-7.5' **Sample Number:** S-3

EBA Engineering, Inc.

Baltimore, MD

Remarks:

○ Moisture content 22.6%

Date tested: 08/2013

Figure

Tested By: SB **Checked By:** SK

Particle Size Distribution Report

	% +3"	% Gravel	% Sand	% Silt	% Clay
○	0.0	0.3	54.9	44.8	

	LL	PL	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
○	48	33	0.9886	0.1772	0.0998					

Material Description	USCS	AASHTO
○ Reddish brown / gray silty sand	SM	A-7-5(4)

Project No. 3090-03-002 **Client:** Gannett Fleming, Inc.

Project: Towson FWR-Generator & Substation Bldgs, Baltimore, MD

○ **Source of Sample:** BT-14 **Depth:** 18.5'-20.0' **Sample Number:** S-6

Remarks:

○ Moisture content = 24.6%

Date tested: 08/2013

EBA Engineering, Inc.

Baltimore, MD

Figure

Tested By: SB **Checked By:** SK

Appendix E
Previous Boring Logs

RECORD OF SUBSURFACE EXPLORATION

Project: Towson Finished Water Reservoir Cover
Location: Towson, Maryland
Job Number: 3090C0139
Inspector: Jiwei Duan
Boring Method: Hollow Stem Auger
Hole Diameter: 6"
Water Level at Completion: 44.4 ', caved @ 47.1 '

Boring Number: BT-1
Drilling Company: EBA Engineering, Inc.
Driller: Duane Addison
Date Drilled: 01-20-06
Surface Elevation: 512.5' (est)
Hammer Weight/Drop: 140 Lbs/30 in.
Water Level After 24 hrs: 40.5 '.

Elevation (ft)	Water/Caved Depth (ft)	Description	Depth (ft)	Sampler	Number	Blows/6"	Recovery (inches)	Remarks
512.5			0					3" topsoil.
512								
511		Brown / reddish brown, moist, loose, silty sand with gravel (fill).			S1	5 - 3 - 4	3	
510								
509								
508		Brown / brownish red, moist, stiff, sandy CLAY, trace gravel (fill).	5		S2	3 - 3 - 7	12	
507								
506		Brown / brownish red, moist, soft, sandy CLAY, little gravel (fill).			S3	2 - 2 - 2	6	
505								
504		Brown / brownish red, moist, soft, sandy CLAY (fill).			S4A	2 - 1 - 1	16	
503		Dark brown, wet, very loose, SAND, trace silt (fill).	10		S4B			
502								
501								
500								
499		Brown, wet, very loose, clayey SAND (fill)			S5	1 - 2 - 2	4	
498			15					
497								
496								
495								
494		Light yellow / pink, moist, stiff, sandy SILT.			S6	3 - 7 - 6	18	
493			20					
492								
491								
490								
489		Pink / white / mottled, moist, stiff, sandy SILT.			S7	3 - 3 - 8	18	
488			25					
487								
486								
485								
484		Pink / white / mottled, moist, stiff, sandy SILT.			S8	3 - 5 - 5	18	
483			30					
482								
481								
480		Mottled, brown, gray, moist, medium dense, silty SAND.			S9	15 - 9 - 6	12	
479								
478								

RECORD OF SUBSURFACE EXPLORATION TOWSON FINISHED WATER RESERVOIR COVERS BORINGS.GPJ EBA ENGINEERING.INC.GDT 3/15/06

EBA Engineering, Inc.
4813 Seton Drive
Baltimore, Maryland 21215

= Standard Penetration Test

Water Level At Completion
Water Level After 24 hrs
Caved Depth At Completion
Caved Depth After 24 hrs

RECORD OF SUBSURFACE EXPLORATION

Project: Towson Finished Water Reservoir Cover
Location: Towson, Maryland
Job Number: 3090C0139
Inspector: Jiwei Duan
Boring Method: Hollow Stem Auger
Hole Diameter: 6"
Water Level at Completion: 44.4 ', caved @ 47.1 '

Boring Number: BT-1
Drilling Company: EBA Engineering, Inc.
Driller: Duane Addison
Date Drilled: 01-20-06
Surface Elevation: 512.5' (est)
Hammer Weight/Drop: 140 Lbs/30 in.
Water Level After 24 hrs: 40.5 ',

Elevation (ft)	Water/Caved Depth (ft)	Description	Depth (ft)	Sampler	Number	Blows/6"	Recovery (inches)	Remarks
477.5								
477								
476								
475								
474								
473		Mottled brown, reddish brown, yellowish brown, white, moist, loose, silty SAND, trace clay.			S10	2 - 4 - 5	18	
472	▼		40					
471								
470								
469								
468	▽	Mottled brown, dark brown, gray, moist, medium dense, silty SAND, trace gravel.			S11	6 - 7 - 10	18	
467			45					
466								
465	⊔							
464								
463		Mottled brown, dark brown, gray, medium dense, silty SAND, trace gravel.			S12	4 - 7 - 9	18	
462			50					
461								
460								
459								
458		Mottled black, black, brown, gray, moist, dense, silty SAND, trace gravel.			S13	5 - 13 - 12	18	
457			55					
456								
455								
454								
453		Mottled white, gray, brown, dense, SAND, trace silt and gravel.			S14	7 - 13 - 15	18	
452			60					Installed temporary monitoring well @ 60.0 feet.
451		Bottom of Boring @ 60.0 ft						
450								
449								
448								
447			65					
446								
445								
444								
443								

RECORD OF SUBSURFACE EXPLORATION TOWSON FINISHED WATER RESERVOIR COVER6 BORINGS.GPJ EBA ENGINEERING INC.GDT 3/16/06

EBA Engineering, Inc.
4813 Seton Drive
Baltimore, Maryland 21215

◫ = Standard Penetration Test

▽ Water Level At Completion
▼ Water Level After 24 hrs
⊔ Caved Depth At Completion
⊠ Caved Depth After 24 hrs

RECORD OF SUBSURFACE EXPLORATION

Project: Towson Finished Water Reservoir Cover
Location: Towson, Maryland
Job Number: 3090C0139
Inspector: Jiwei Duan
Boring Method: Hollow Stem Auger
Hole Diameter: 6"
Water Level at Completion: 35.3 ', caved @ 47.8 '

Boring Number: BT-2
Drilling Company: EBA Engineering, Inc.
Driller: Duane Addison
Date Drilled: 01-19-06
Surface Elevation: 512' (est)
Hammer Weight/Drop: 140 Lbs/30 in.
Water Level After 24 hrs: 32.5 ', caved @ 43.2 '

Elevation (ft)	Water/Caved Depth (ft)	Description	Depth (ft)	Sampler	Number	Blows/6"	Recovery (inches)	Remarks
512			0					2" topsoil.
511		Brown, moist, loose, silty sand, some gravel (Fill).			S1	4 - 5 - 5	10	
510								
509								
508		No recovery.			S2	5 - 6 - 6	6	
507			5					Bulk sample collected from 1.0 to 10.0 feet.
506								
505		Reddish brown, moist, very loose, clayey SAND, trace gravel (fill).			S3	2 - 2 - 2	8	
504								
503		Reddish brown / dark brown, moist,very loose, clayey SAND, trace silt (fill).			S4	2 - 1 - 2	2	
502			10					
501								
500								
499								
498		Light gray / brown, moist, soft, sandy SILT with gravel (fill).			S5	2 - 2 - 2	9	
497			15					
496								
495								
494								
493		Brown / reddish brown, moist, very stiff, sandy CLAY with gravel (fill).			S6	5 - 8 - 9	11	
492			20					
491								
490								
489								
488		Brown, moist, medium dense, silty SAND, trace gravel (fill).			S7	6 - 6 - 7	6	
487			25					
486								
485								
484								
483		Mottled red / gray, moist, stiff, sandy SILT.			S8	3 - 6 - 6	18	
482			30					
481								
480	▼							
479								
478		Mottled gray / white, moist, medium dense, silty SAND, little gravel.			S9	5 - 7 - 8	18	

RECORD OF SUBSURFACE EXPLORATION TOWSON FINISHED WATER RESERVOIR COVERS BORINGS.GPJ EBA ENGINEERING INC.GDT 3/16/06

EBA Engineering, Inc.
4813 Seton Drive
Baltimore, Maryland 21215

= Standard Penetration Test

Water Level At Completion
Water Level After 24 hrs
Caved Depth At Completion
Caved Depth After 24 hrs

RECORD OF SUBSURFACE EXPLORATION

Project: Towson Finished Water Reservoir Cover
Location: Towson, Maryland
Job Number: 3090C0139
Inspector: Jiwei Duan
Boring Method: Hollow Stem Auger
Hole Diameter: 6"
Water Level at Completion: 35.3 ', caved @ 47.8 '

Boring Number: BT-2
Drilling Company: EBA Engineering, Inc.
Driller: Duane Addison
Date Drilled: 01-19-06
Surface Elevation: 512' (est)
Hammer Weight/Drop: 140 Lbs/30 in.
Water Level After 24 hrs: 32.5 ', caved @ 43.2 '

Elevation (ft)	Water/Caved Depth (ft)	Description	Depth (ft)	Sampler	Number	Blows/6"	Recovery (inches)	Remarks
477								
476	▽							
475								
474								
473		Mottled dark gray / black / white, wet, medium dense, silty SAND, trace gravel.			S10	3 - 7 - 8	18	
472								
471								
470								
469	▨							Observed wet spoon.
468		Dark brown, moist, dense, silty SAND, trace gravel.			S11	10 - 11 - 17	18	
467								
466								
465								
464	⊔							
463		Mottled dark brown / white, very dense, SAND with gravel.			S12	26 - 63 - 50	14	
462								
461								
460								
459								
458		Dark gray, moist, very dense, silty SAND, trace gravel.			S13	100/4"	4	
457								
456								
455								
454					S14	100/2"	2	
453		Dark gray, moist, very dense, SAND, trace gravel.						
452		Bottom of Boring @ 58.7 ft						
451								
450								
449								
448								
447								
446								
445								
444								
443								

35 40 45 50 55 60 65

RECORD OF SUBSURFACE EXPLORATION TOWSON FINISHED WATER RESERVOIR COVERS BORINGS.GPJ EBA ENGINEERING INC GDT 3/15/06

EBA Engineering, Inc.
4813 Seton Drive
Baltimore, Maryland 21215

◫ = Standard Penetration Test

▽ Water Level At Completion
▼ Water Level After 24 hrs
⊔ Caved Depth At Completion
▨ Caved Depth After 24 hrs

RECORD OF SUBSURFACE EXPLORATION

Project: Towson Finished Water Reservoir Cover
Location: Towson, Maryland
Job Number: 3090C0139
Inspector: Girish Bhatt
Boring Method: Hollow Stem Auger
Hole Diameter: 6"
Water Level at Completion: 13.5 ', caved @ 31.5 '

Boring Number: BT-12
Drilling Company: EBA Engineering, Inc.
Driller: John Accord
Date Drilled: 02-27-06 & 02-28-06
Surface Elevation: 493.5' (est)
Hammer Weight/Drop: 140 Lbs/30 in.
Water Level After 24 hrs: 18.8 ', caved @ 21.3 '

Elevation (ft)	Water/Caved Depth (ft)	Description	Depth (ft)	Sampler	Number	Blows/6"	Recovery (inches)	Remarks
493.5			0					
493								1" topsoil.
492		Brownish red / reddish brown, moist, stiff, sandy SILT (fill).			S1	3 - 4 - 7	8	
491								
490		Brownish yellow, moist, stiff, SILT, trace sand.			S2	7 - 5 - 6	12	
489			5					
488								
487		Brownish yellow / light gray, moist, sandy SILT, trace gavel.			S3	7 - 12 - 15	18	
486								
485		Light gray / light brown, moist, very stiff, sandy SILT.			S4	7 - 8 - 10	12	
484			10					
483								
482								
481								
480	▽	Light gray / pink, moist, dense, silty SAND, trace to little gravel.			S5	10 - 11 - 14	13	
479			15					
478								
477								
476								
475	▼	Gray / pink, moist, medium dense, silty SAND, trace to little gravel.			S6	13 - 11 - 13	15	
474								
473			20					
472	▨							
471								
470		Gray / pink, moist, dense, silty SAND, trace to little gravel.			S7	10 - 21 - 27	15	
469								
468			25					
467								
466								
465		Gray / pink, moist to wet, very dense, silty SAND, little gravel.			S8	100/5"	5	
464								Observed wet spoon.
463			30					
462	⊥							
461								
460		Gray / pink, moist, very dense, SAND with gravel.			S9	100/1"	1	Auger refusal @ 34.0 feet.

RECORD OF SUBSURFACE EXPLORATION TOWSON FINISHED WATER RESERVOIR COVERS BORINGS.GPJ EBA ENGINEERING INC.GDT 3/16/06

EBA Engineering, Inc.
4813 Seton Drive
Baltimore, Maryland 21215

= Standard Penetration Test
= Rock Core

▽ Water Level At Completion
▼ Water Level After 24 hrs
⊥ Caved Depth At Completion
▨ Caved Depth After 24 hrs

RECORD OF SUBSURFACE EXPLORATION

Project: Towson Finished Water Reservoir Cover
Location: Towson, Maryland
Job Number: 3090C0139
Inspector: Girish Bhatt
Boring Method: Hollow Stem Auger
Hole Diameter: 6"
Water Level at Completion: 13.5 ', caved @ 31.5 '

Boring Number: BT-12
Drilling Company: EBA Engineering, Inc.
Driller: John Accord
Date Drilled: 02-27-06 & 02-28-06
Surface Elevation: 493.5' (est)
Hammer Weight/Drop: 140 Lbs/30 in.
Water Level After 24 hrs: 18.8 ', caved @ 21.3 '

Elevation (ft)	Water/Caved Depth (ft)	Description	Depth (ft)	Sampler	Number	Blows/6"	Recovery (inches)	Remarks
459								
458		Gray / pink, SAND with gravel.	35		RC1		15	Installed temporary monitoring well @ 34.0 feet. REC = 25%, RQD = 0%
457								
456								
455								
454		Bottom of Boring @ 39.0 ft	40					
453								
452								
451								
450								
449			45					
448								
447								
446								
445								
444								
443			50					
442								
441								
440								
439								
438			55					
437								
436								
435								
434								
433			60					
432								
431								
430								
429								
428			65					
427								
426								
425								

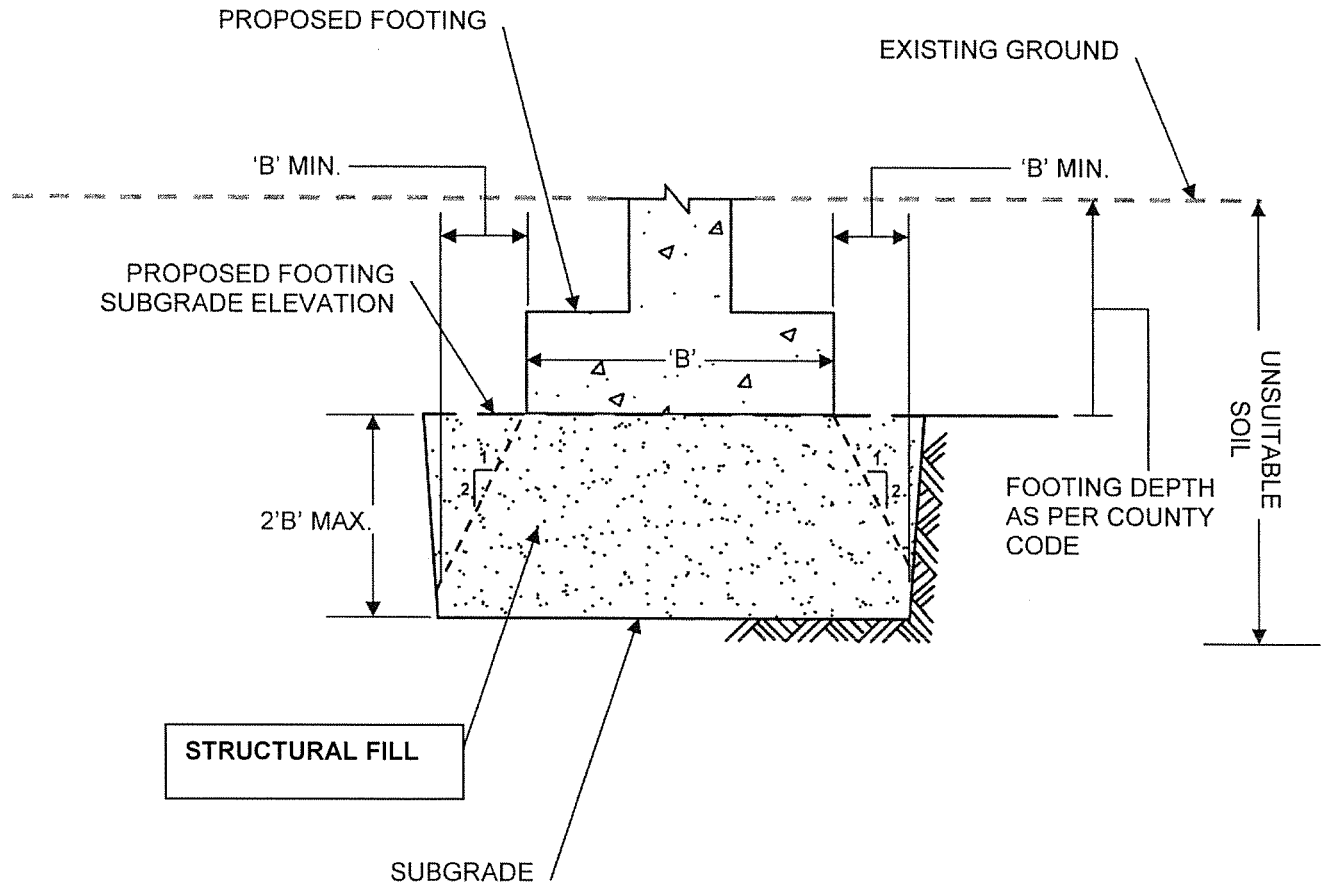
RECORD OF SUBSURFACE EXPLORATION TOWSON FINISHED WATER RESERVOIR COVERS BORINGS.GPJ EBA ENGINEERING INC.GDT 3/16/06

EBA Engineering, Inc.
4813 Seton Drive
Baltimore, Maryland 21215

= Standard Penetration Test
= Rock Core

Water Level At Completion
Water Level After 24 hrs
Caved Depth At Completion
Caved Depth After 24 hrs

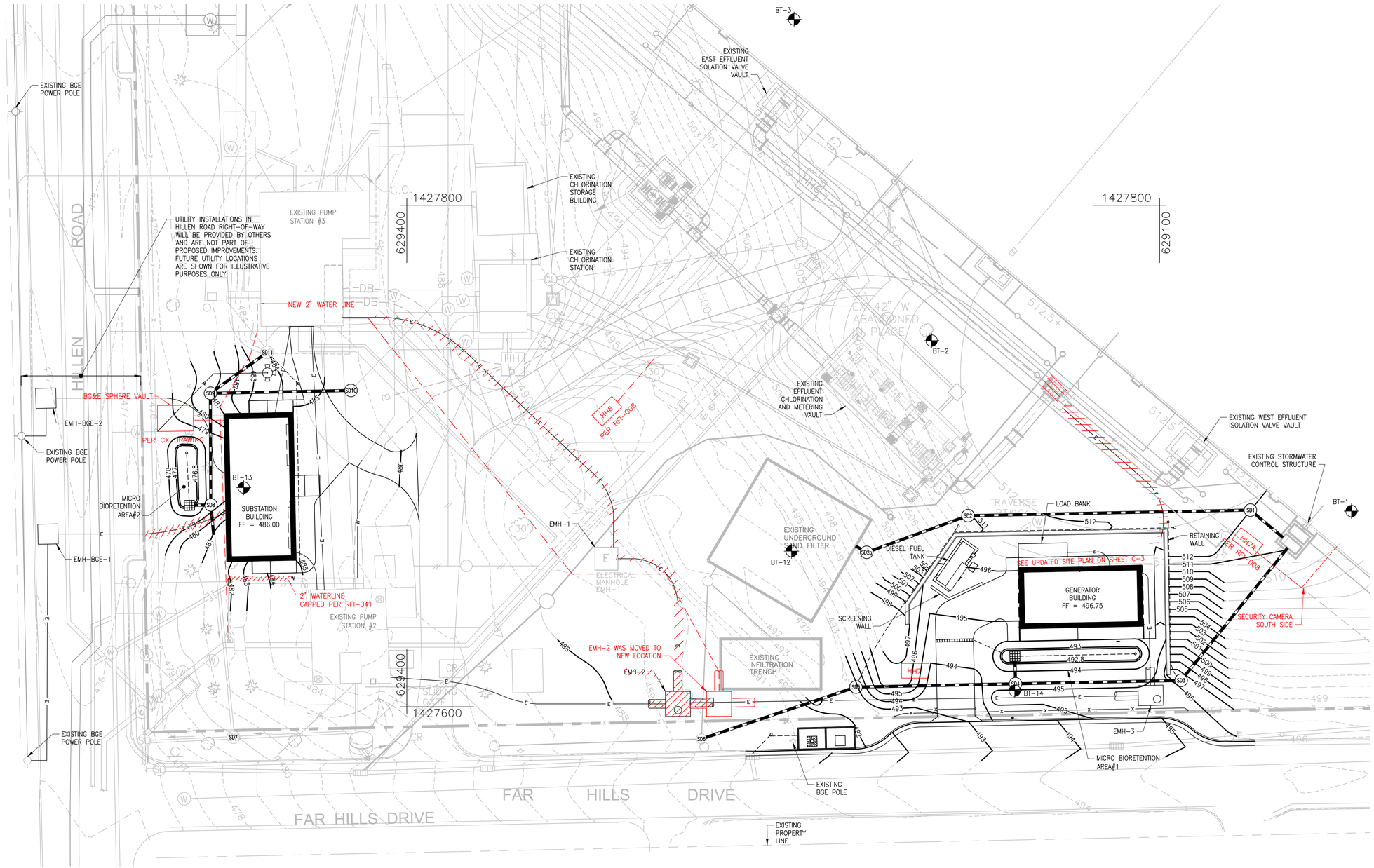
Appendix F
Footing Subgrade Modification Detail



EBA ENGINEERING, INC. *4813 Seton Drive* *Baltimore, Maryland 21215*	Project Name: **TOWSON FINISHED WATER RESERVOIR - GENERATOR & SUBSTATION BUILDINGS** **BALTIMORE, MD**	Figure: **Footing Subgrade Modification Detail** Date: 8/23/13 Job No.: 3090-03-002 Prepared by: GCB Not to Scale

Contract No.20203 WX0
Addendum No.6
October 27, 2023

REVISIONS			
NO.	DESCRIPTION	DATE	BY



BORING PLAN
SCALE: 1"=20'

LEGEND

EX. WATER MANHOLE OR VALVE BOX	W
EX. ELECTRIC MANHOLE	E
EX. CHLORINE MANHOLE	CL
EX. SANITARY MANHOLE	SD
EX. FIRE HYDRANT	
EX. ELECTRIC POLE	
EX. TRAFFIC SIGN	
EX. LEAKAGE CONTROL WELL	
EX. FENCE	x x x
MAJOR CONTOURS	500
MINOR CONTOURS	501
GRADE BREAKLINE	
EX. AT GRADE INLET	
EX. GOOSENECK VENT	
ABANDONED SERVICE	// //
EX. PROPERTY LINE	
EBA TRAVERSE POINT	
EX. WELL CONTROL PANEL	
EX. VALVE	
PR. CONTOURS	501
PR. INLET	
BORING LOCATION	BT-1
PR. STORM DRAIN PIPE	
PR. STORM DRAIN MANHOLE	SD1

20 0 20 40
SCALE IN FEET

Contract No.20203 WX0
Addendum No.6
October 27, 2023

AS-BUILT DRAWINGS
REVISIONS BY: DHJ DATE: APRIL 2019
THESE RECORD DRAWINGS HAVE BEEN PREPARED, IN PART, ON THE BASIS OF INFORMATION COMPILED BY OTHERS. THEY ARE NOT INTENDED TO REPRESENT IN DETAIL THE EXACT LOCATION, TYPE OF COMPONENT OR MANNER OF CONSTRUCTION. THE ENGINEER WILL NOT BE RESPONSIBLE FOR ANY ERRORS OR OMISSIONS WHICH HAVE BEEN INCORPORATED INTO THE DRAWINGS.

Gannett Fleming
BALTIMORE, MARYLAND

CITY OF BALTIMORE
DEPARTMENT OF PUBLIC WORKS
OFFICE OF ENGINEERING & CONSTRUCTION

WATER CONTRACT NO. 1295R
TOWSON GENERATOR AND MAIN SUBSTATION

BORING LOCATION PLAN

DESIGNED BY: R.V.A.	
CHECKED BY: J.V.D.	
DRAWN BY: K.D.J.	

AS-BUILT
CONSULTANT: GANNETT FLEMING, INC.
DATE: 4/22/2019 CHECKED BY: DHJ
THE ORIGINAL MYLAR HAS BEEN REPLACED WITH THIS AS-BUILT MYLAR.

SCALE: 1"=20'	C-16
DATE: 11/22/17	
CAD FILE: 52874 C-16 BOR.dwg	SHEET 68 OF 93

REVISIONS			
NO.	DESCRIPTION	DATE	BY

RECORD OF SUBSURFACE EXPLORATION

Project: Towson Finished Water Reservoir Cover
Location: Towson, Maryland
Job Number: 3090C0139
Inspector: Jiwei Duan
Boring Method: Hollow Stem Auger
Hole Diameter: 6"
Water Level at Completion: 44.4', caved @ 47.1'

Boring Number: BT-1
Drilling Company: EBA Engineering, Inc.
Driller: Duane Addison
Date Drilled: 01-20-06
Surface Elevation: 512.5' (est)
Hammer Weight/Drop: 140 Lbs/30 in.
Water Level After 24 hrs: 40.5',

Elevation (ft)	Water Level Depth (ft)	Description	Depth (ft)	Sampler	Number	Blows/6"	Recovery (inches)	Remarks
512.5			0					3" topsoil.
		Brown / reddish brown, moist, loose, silty sand with gravel (fill).		SS	S1	5 - 3 - 4	8	
		Brown / brownish red, moist, stiff, sandy CLAY, trace gravel (fill).	5	SS	S2	3 - 3 - 7	12	
		Brown / brownish red, moist, soft, sandy CLAY, little gravel (fill).		SS	S3	2 - 2 - 2	6	
		Brown / brownish red, moist, soft, sandy CLAY (fill). Dark brown, wet, very loose, SAND, trace silt (fill).	10	SS	S4A S4B	2 - 1 - 1	16	
		Brown, wet, very loose, clayey SAND (fill)	15	SS	S5	1 - 2 - 2	4	
		Light yellow / pink, moist, stiff, sandy SILT.	20	SS	S6	3 - 7 - 6	18	
		Pink / white / mottled, moist, stiff, sandy SILT.	25	SS	S7	3 - 3 - 5	18	
		Pink / white / mottled, moist, stiff, sandy SILT.	30	SS	S8	3 - 5 - 5	18	
		Mottled, brown, gray, moist, medium dense, silty SAND.		SS	S9	15 - 9 - 6	12	

EBA Engineering, Inc.
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Baltimore, Maryland 21215

= Standard Penetration Test

Water Level At Completion
Water Level After 24 hrs
Caved Depth At Completion
Caved Depth After 24 hrs

Sheet: 1 of 2

RECORD OF SUBSURFACE EXPLORATION

Project: Towson Finished Water Reservoir Cover
Location: Towson, Maryland
Job Number: 3090C0139
Inspector: Jiwei Duan
Boring Method: Hollow Stem Auger
Hole Diameter: 6"
Water Level at Completion: 44.4', caved @ 47.1'

Boring Number: BT-1
Drilling Company: EBA Engineering, Inc.
Driller: Duane Addison
Date Drilled: 01-20-06
Surface Elevation: 512.5' (est)
Hammer Weight/Drop: 140 Lbs/30 in.
Water Level After 24 hrs: 40.5',

Elevation (ft)	Water Level Depth (ft)	Description	Depth (ft)	Sampler	Number	Blows/6"	Recovery (inches)	Remarks
477.5			35					
		Mottled brown, reddish brown, yellowish brown, white, moist, loose, silty SAND, trace clay.	40	SS	S10	2 - 4 - 5	15	
		Mottled brown, dark brown, gray, moist, medium dense, silty SAND, trace gravel.	45	SS	S11	6 - 7 - 10	18	
		Mottled brown, dark brown, gray, medium dense, silty SAND, trace gravel.	50	SS	S12	4 - 7 - 9	18	
		Mottled black, black, brown, gray, moist, dense, silty SAND, trace gravel.	55	SS	S13	5 - 13 - 12	18	
		Mottled white, gray, brown, dense, SAND, trace silt and gravel.	60	SS	S14	7 - 13 - 15	18	Installed temporary monitoring well @ 60.0 feet.
		Bottom of Boring @ 60.0 ft	65					

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= Standard Penetration Test

Water Level At Completion
Water Level After 24 hrs
Caved Depth At Completion
Caved Depth After 24 hrs

Sheet: 2 of 2

RECORD OF SUBSURFACE EXPLORATION

Project: Towson Finished Water Reservoir Cover
Location: Towson, Maryland
Job Number: 3090C0139
Inspector: Jiwei Duan
Boring Method: Hollow Stem Auger
Hole Diameter: 6"
Water Level at Completion: 35.3 ', caved @ 47.8 '

Boring Number: BT-2
Drilling Company: EBA Engineering, Inc.
Driller: Duane Addison
Date Drilled: 01-19-06
Surface Elevation: 512' (est)
Hammer Weight/Drop: 140 Lbs/30 in.
Water Level After 24 hrs: 32.5 ', caved @ 43.2 '

Elevation (ft)	Water Level Depth (ft)	Description	Depth (ft)	Sampler	Number	Blows/6"	Recovery (inches)	Remarks
512			0					2" topsoil.
		Brown, moist, loose, silty sand, some gravel (Fill).		SS	S1	4 - 5 - 5	10	
		No recovery.	5	SS	S2	5 - 6 - 6	6	Bulk sample collected from 1.0 to 10.0 feet.
		Reddish brown, moist, very loose, clayey SAND, trace gravel (fill).		SS	S3	2 - 2 - 2	8	
		Reddish brown / dark brown, moist,very loose, clayey SAND, trace silt (fill).	10	SS	S4	2 - 1 - 2	2	
		Light gray / brown, moist, soft, sandy SILT with gravel (fill).	15	SS	S5	2 - 2 - 3	9	
		Brown / reddish brown, moist, very stiff, sandy CLAY with gravel (fill).	20	SS	S6	5 - 8 - 9	11	
		Brown, moist, medium dense, silty SAND, trace gravel (fill).	25	SS	S7	6 - 8 - 7	6	
		Mottled red / gray, moist, stiff, sandy SILT.	30	SS	S8	3 - 6 - 6	16	
		Mottled gray/ white, moist, medium dense, silty SAND, little gravel		SS	S9	5 - 7 - 8	18	

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Baltimore, Maryland 21215

= Standard Penetration Test

Water Level At Completion
Water Level After 24 hrs
Caved Depth At Completion
Caved Depth After 24 hrs

Sheet: 1 of 2

RECORD OF SUBSURFACE EXPLORATION

Project: Towson Finished Water Reservoir Cover
Location: Towson, Maryland
Job Number: 3090C0139
Inspector: Jiwei Duan
Boring Method: Hollow Stem Auger
Hole Diameter: 6"
Water Level at Completion: 35.3 ', caved @ 47.8 '

Boring Number: BT-2
Drilling Company: EBA Engineering, Inc.
Driller: Duane Addison
Date Drilled: 01-19-06
Surface Elevation: 512' (est)
Hammer Weight/Drop: 140 Lbs/30 in.
Water Level After 24 hrs: 32.5 ', caved @ 43.2 '

Elevation (ft)	Water Level Depth (ft)	Description	Depth (ft)	Sampler	Number	Blows/6"	Recovery (inches)	Remarks
477			35					
		Mottled dark gray / black / white, wet, medium dense, silty SAND, trace gravel.	40	SS	S10	3 - 7 - 8	18	
		Dark brown, moist, dense, silty SAND, trace gravel.	45	SS	S11	10 - 11 - 17	16	Observed wet spoon.
		Mottled dark brown / white, very dense, SAND with gravel.	50	SS	S12	26 - 63 - 50	14	
		Dark gray, moist, very dense, silty SAND, trace gravel.	55	SS	S13	100/4"	4	
		Dark gray, moist, very dense, SAND, trace gravel.	60	SS	S14	100/2"	2	
		Bottom of Boring @ 58.7 ft	65					

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= Standard Penetration Test

Water Level At Completion
Water Level After 24 hrs
Caved Depth At Completion
Caved Depth After 24 hrs

Sheet: 2 of 2

RECORD OF SUBSURFACE EXPLORATION

Project: Towson Finished Water Reservoir Cover
Location: Towson, Maryland
Job Number: 3090C0139
Inspector: Girish Bhatt
Boring Method: Hollow Stem Auger
Hole Diameter: 6"
Water Level at Completion: 44.0', caved @ 47.0'

Boring Number: BT-12
Drilling Company: EBA Engineering, Inc.
Driller: John Accord
Date Drilled: 02-27-06 & 02-28-06
Surface Elevation: 493.6' (est)
Hammer Weight/Drop: 140 Lbs/30 in.
Water Level After 24 hrs: 18.8', caved @ 21.3'

Elevation (ft)	Water Level Depth (ft)	Description	Depth (ft)	Sampler	Number	Blows/6"	Recovery (inches)	Remarks
493.5			0					1" topsoil.
		Brownish red / reddish brown, moist, stiff, sandy SILT (fill).		SS	S1	3 - 4 - 7	8	
		Brownish yellow, moist, stiff, SILT, trace sand.	5	SS	S2	7 - 5 - 9	12	
		Brownish yellow / light gray, moist, sandy SILT, trace gavel.		SS	S3	7 - 12 - 15	18	
		Light gray / light brown, moist, very stiff, sandy SILT.	10	SS	S4	7 - 8 - 10	12	
		Light gray / pink, moist, dense, silty SAND, trace to little gravel.	15	SS	S5	10 - 11 - 14	13	
		Gray / pink, moist, medium dense, silty SAND, trace to little gravel.	20	SS	S6	13 - 11 - 13	15	
		Gray / pink, moist, dense, silty SAND, trace to little gravel.	25	SS	S7	10 - 21 - 27	15	
		Gray / pink, moist to wet, very dense, silty SAND, little gravel.	30	SS	S8	100/5"	5	Observed wet spoon.
		Gray / pink, moist, very dense, SAND with gravel.		SS	S9	100/1"	1	Auger refusal @ 34.0 feet.

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= Standard Penetration Test
= Rock Core

Water Level At Completion
Water Level After 24 hrs
Caved Depth At Completion
Caved Depth After 24 hrs

Sheet: 1 of 2

RECORD OF SUBSURFACE EXPLORATION

Project: Towson Finished Water Reservoir Cover
Location: Towson, Maryland
Job Number: 3090C0139
Inspector: Girish Bhatt
Boring Method: Hollow Stem Auger
Hole Diameter: 6"
Water Level at Completion: 13.5', caved @ 31.6'

Boring Number: BT-12
Drilling Company: EBA Engineering, Inc.
Driller: John Accord
Date Drilled: 02-27-06 & 02-28-06
Surface Elevation: 493.6' (est)
Hammer Weight/Drop: 140 Lbs/30 in.
Water Level After 24 hrs: 18.8', caved @ 21.3'

Elevation (ft)	Water Level Depth (ft)	Description	Depth (ft)	Sampler	Number	Blows/6"	Recovery (inches)	Remarks
494			35					
		Gray / pink, SAND with gravel.	40	SS	RC1		15	Installed temporary monitoring well @ 34.0 feet. REC = 35%, RQD = 0%
		Bottom of Boring @ 39.0 ft	45					
			50					
			55					
			60					
			65					

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= Standard Penetration Test
= Rock Core

Water Level At Completion
Water Level After 24 hrs
Caved Depth At Completion
Caved Depth After 24 hrs

Sheet: 2 of 2

RECORD OF SUBSURFACE EXPLORATION

Project: Towson Finished Water Reservoir - Generator & Substation Bldgs
Location: Baltimore, MD
Job Number: 3090-03
Inspector: Girish Bhatt
Boring Method: HSA
Hole Diameter: 8"
Water Level at Completion: Dry @ 19.0'
Water Level After 24 hrs: Dry @ 19.0'

Boring Number: BT-13
Drilling Company: MDA Drilling Inc.
Driller: Duane Addison
Date Drilled: 08-01-13 & 08-01-13
Surface Elevation: 482' (est)
Hammer Weight/Drop: 140 lb/30 in
Northing: N/A
Easting: N/A

Elevation (ft)	Description	Depth (ft)	Sampler	Number	Blows/6"	Recovery (inches)	Remarks
482		0					5 inches of topsoil.
	Brown, moist, very stiff, sandy SILT, trace gravel and roots (Fill).		SS	S-1	5 - 7 - 11	16	
	Reddish brown / gray, moist, medium stiff, sandy CLAY (Fill).	5	SS	S-2	3 - 2 - 3	10	
	Reddish brown / light brown, moist, medium dense, silty SAND (Fill).		SS	S-3	2 - 7 - 5	7	
	Reddish brown / gray, moist, medium dense, silty SAND (Residual Soil).	10	SS	S-4	3 - 7 - 10	18	
	Gray / white / pink, moist, dense, silty SAND (Residual Soil).	15	SS	S-5	7 - 13 - 23	18	
	Dark brown / light brown, moist, dense, silty SAND (Residual Soil).	20	SS	S-6	5 - 14 - 28	18	Installed temporary pipe @ 19.0 feet.
	Bottom of Boring @ 20.0 ft	25					

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= Split Spoon

Water Level At Completion
Water Level After 24 hrs
Caved Depth At Completion
Caved Depth After 24 hrs

Sheet: 1 of 1

RECORD OF SUBSURFACE EXPLORATION

Project: Towson Finished Water Reservoir - Generator & Substation Bldgs
Location: Baltimore, MD
Job Number: 3090-03
Inspector: Girish Bhatt
Boring Method: HSA
Hole Diameter: 8"
Water Level at Completion: Dry @ 20.0'
Water Level After 24 hrs: Dry @ 20.0'

Boring Number: BT-14
Drilling Company: MDA Drilling Inc.
Driller: Duane Addison
Date Drilled: 08-01-13 & 08-01-13
Surface Elevation: 494' (est)
Hammer Weight/Drop: 140 lb/30 in
Northing: N/A
Easting: N/A

Elevation (ft)	Description	Depth (ft)	Sampler	Number	Blows/6"	Recovery (inches)	Remarks
494		0					No topsoil, construction site.
	Gray, dry, very dense, GRAVEL, trace sand (Fill).		SS	S-1	27 - 37 - 23	12	
	Gray / dark brown, dry, very dense, GRAVEL, with sand, trace roots and plastic pieces (Fill).	5	SS	S-2	50/1"	1	
	Light brown / white, moist, very stiff, sandy CLAY.		SS	S-3	20 - 15 - 15	15	
	Light brown / white, moist, stiff, sandy CLAY.	10	SS	S-4	7 - 7 - 7	2	
	Reddish brown / gray, moist, very dense, silty SAND (Residual Soil)	15	SS	S-5	23 - 23 - 30	3	Two attempts.
	Reddish brown / gray, moist, medium dense, silty SAND (Residual Soil).	20	SS	S-6	30 - 14 - 16	12	Installed temporary pipe @ 20.0 feet.
	Bottom of Boring @ 20.0 ft	25					

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= Split Spoon

Water Level At Completion
Water Level After 24 hrs
Caved Depth At Completion
Caved Depth After 24 hrs

Sheet: 1 of 1

Contract No.20203 WX0
Addendum No.6
October 27, 2023

AS-BUILT DRAWINGS
REVISIONS BY: DHJ DATE: APRIL 2019
THESE RECORD DRAWINGS HAVE BEEN PREPARED, IN PART, ON THE BASIS OF INFORMATION COMPILED BY OTHERS. THEY ARE NOT INTENDED TO REPRESENT IN DETAIL THE EXACT LOCATION, TYPE OF COMPONENT OR MANNER OF CONSTRUCTION. THE ENGINEER WILL NOT BE RESPONSIBLE FOR ANY ERRORS OR OMISSIONS WHICH HAVE BEEN INCORPORATED INTO THE DRAWINGS.

Gannett Fleming
BALTIMORE, MARYLAND

CITY OF BALTIMORE
DEPARTMENT OF PUBLIC WORKS
OFFICE OF ENGINEERING & CONSTRUCTION

WATER CONTRACT NO. 1295R
TOWSON GENERATOR AND MAIN SUBSTATION

BORING LOGS

DESIGNED BY:	R.V.A.
CHECKED BY:	J.V.D.
DRAWN BY:	K.D.J.

AS-BUILT
CONSULTANT: GANNETT FLEMING, INC.
DATE: 4/22/2019 CHECKED BY: DHJ

THE ORIGINAL MYLAR HAS BEEN REPLACED WITH THIS AS-BUILT MYLAR.

SCALE:	NONE
DATE:	11/22/17
CAD FILE:	52874 C-17 BOR LOG1.dwg

C-17
SHEET 69 OF 93

FILE REF. W-0000-00000